The Entry Section as a mean to reduce mill downtime

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Continuous Feeding of Strip

During the last few years, tube mills have become more sophisticated, the production speed capability has increased, and equipment cost has soared.
Consequently economics dictates a maximum reduction of mill downtime. New technology, such as quick-change tooling and other improvements, has been developed to achieve this goal and augment mill efficiency.
The entry section, too, has received more attention, and has been shifted its position from a peripheral to a main line component status. The price for a state-of-the-art entry section is now up to almost 50% of the mill's cost –which is still difficult for some companies to accept. However, the entry section is just as important as the mill. The entry section is responsible for providing one of the basic components of tube production –the strip- to the rolling mill. Continuous feeding of strip is one key element in reducing mill downtime.
Coil joining has been calculated to represent between 30% and 60% of mill downtime on high production lines. It is almost impossible to determine the cost of coil change, as the related conditions are different for each company and each line. However, some companies have experienced production improvements of 25% by implementing continuous feeding. Included in these production improvements is not only decreased mill downtime, but also reduced scrap.
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Selecting Entry Line Equipment

The main factors influencing the selection of entry line equipment are dictated by the final product and production method applied. Consideration must be given to (1) raw material quality, its mechanical properties, and its surface; (2) strip dimension range; (3) coil dimension availability; (4) final product properties and surface finish; (5) production method, welding system, and special requirements (such as trimming of strip edges); (6)end weld requirements; and (7) production speed.
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Hands-Free Operation

The main reasons for going to an automated system, or hands-free operation, are (1) keeping up with high production speed; (2) reducing manual workload (strip weight); (3) providing end weld repeatability; (4) improving operator safety. As many as 16 operations must be performed for coil joining within a limited period of time. That period of time decreases as production speed increases. The basic factors influencing continuous strip feeding are (1) coil weight (length of strip on original coil); (2) end weld handling time; (3) production speed; (4) continuous system in-feed speed. In most cases, the continuous system's in-feed speed is a factor of the production speed. Even if this speed can be varied slightly, it will remain between 2.5 and 3 times the mill speed due to mechanical

design limitations (acceleration and deceleration of the uncoiler under strip constant tension). Technical people involved in day-to-day production will understand the problems involved in safely uncoiling light-gauge strip at 2000FPM or a 10-ton heavy-gauge coil at 600 FPM.
Consequently the basic coil must be big enough to cover the downtime required for end welding at a given production speed. Therefore, the automated system's main purpose is to reduce this downtime to a minimum.
Because the time required for welding depends on the welding system used and is, therefore, only slightly influenceable, the main field of intervention is the handling portion of the end weld cycle. Most of the mentioned 16 operations can be automated and partially superimposed to save time. As an example, with a double uncoiler, the coil can be opened off-line and the uncoiler's 180 degrees rotation initiated automatically while the strip end is being positioned into the end welder at about the same time as the previous end is being sheared and prepared for welding. The loading and opening of a new coil can also be automated and executed during the welding operation. Modern lines have resulted in a cycle time of just 75 seconds handling medium-to-heavy gauge strip.
Again, technical production people know very well that a tube is only as good as the quality of the strip fed into the mill. Quality consistency is affected by many factors, many of which are influenced by the operator's performance.
Beside time reduction, a great advantage of hands-free operation is that the required functions are performed without manual intervention of the operator, without strain and fatigue, precisely, and with predictable repeatability. The operator becomes a system manager dedicated more to supervision than to manual performance, with his main tasks and responsibilities being uninterrupted feeding of the mill and monitoring the quality of the strip supply.
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Conclusion

With the introduction of modern high-speed tube mills, the entry section can no longer be considered of secondary importance. Carefully selected entry section equipment, engineered and optimized for the intended application, can help reduce mill downtime and scrap while maintaining quality at high production speeds and easing the operator's workload.
Purchasing state-of-the-art entry section equipment involves a large investment that can be difficult for some tube producers to accept. However, the operating advantages of this equipment can translate into economic benefits to help justify the initial cost.